

State Defendants' Hearing Exhibit 4

Curling v. Raffensperger,
Dkt. No. 1:17-CV-2989-AT

Executive Summary

CES undertook an effort to review how various reductions to the default, ambiguous mark threshold setting within Democracy Suite 5.5.A would impact the scanning and interpretation of ambiguously marked ballot samples. The examination was done in an effort to increase absentee ballot scanning efficiency and reduce the need to adjudicate ballots that reflect a clear voter intent. Through this effort, CES concluded a High-End ambiguous setting of 20% partnered with a Low-End ambiguous setting of 10% enabled the ICC scanner to interpret and register properly the intent shown by the ballot samples without requiring the user to adjudicate the ballot samples further, while still providing a safety mechanism to notify the end user when the ICC scanner encounters a mark where the system cannot determine intent.

Of additional interest during the examination, CES observed that marks made with blue and black ink required less adjudication than marks made with red ink. Finally, instructions to the voter should be redesigned to provide a possible visual clue on how to properly mark the hand-marked ballot and also direct the voter to NOT circle or underline their selected choice. Democracy Suite 5.5A is not designed to register voter intent from a hand-marked ballot if the vote target area (oval to the left of the choice) is not marked in some manner.

Review of Ambiguous Mark High-End Threshold Setting

Democracy Suite 5.5A gives the end user the ability to adjust ambiguous mark low-end and high-end threshold settings used by the ICP and ICC scanners to interpret voter intent on hand-marked optical scan ballots.

The default settings within Democracy Suite 5.5A are the following:

- Low-End: 12%
- High-End: 35%

When a ballot is scanned by either the ICP or ICC scanners with the above Low-End setting, any mark deemed by the scanner to be less than 12% darkened within the vote target areas (ovals to the left of the choices in each contest on a printed GA ballot) is designated as blank vote for the given contest.

When a ballot is scanned by either the ICP or ICC scanners with the above High-End setting, any mark deemed by the scanner to be equal to or greater than 35% darkened within the vote target areas (ovals to the left of the choices in each contest on a printed GA ballot) is designated as a vote for the choice associated to the target area marked.

When a ballot is scanned by either the ICP or ICC scanners with the above Low-End and High-End settings, any mark deemed by the scanner to be equal to 12% or less than 35% darkened within the vote target areas (ovals to the left of the choices in each contest on a printed GA ballot) is designated as an ambiguous mark. Any ambiguous mark isolated by either the ICP or ICC scanner within a vote target area does not increment the vote total forward for the associated choice. It is anticipated that ballots isolated by the ICP or ICC scanners containing scanner-deemed ambiguous marks are adjudicated manually or electronically by the designated election official in order to determine the voter intent that is in question by the ICP or ICC scanners.

CES undertook an examination to try and determine if the High-End setting of 35% is forcing election officials to review ballots that should instead be processed as marked by the ICC scanner on the initial read by the ICC scanner.

To accomplish this examination a test deck of 100 hand-marked optical scan ballots was prepared. The instructions at the top of the ballot instruct the voter to fill in the oval next to the candidate of their choice. The filling in of the oval (vote target area) is designed to provide a clear intent for the ICC scanner to interpret. When placing marks on the test deck, testers did not fill in the vote target areas as instructed by the instructions at the top of each ballot. Instead testers placed a variety of marks that only darkened a portion of the vote target areas on the test deck of ballots. Each test ballot had a total of 6 vote target areas. Testers used the same type of variable mark within each of the three contests when marking a ballot in an attempt to simulate how an individual voter would most likely mark each oval on their ballot in the same manner throughout. Testers also used differing marking devices (ie., blue ink, blank ink, red ink, pencil, etc.) and marking pressures. Testers also marked some test ballots in a manner where the vote area was not touched to confirm that marks outside the vote areas would not be recognized.

After marking the test deck, testers provided an opinion on how the ICC Scanner would interpret the marked ballot. Testers provided one of the following opinions for each test ballot:

- Marked – Scanner would interpret the mark within all vote target areas on the ballot and increment vote totals and ballots cast total forward
- Ambiguous – Scanner would not be able to determine marks and set ballot aside for review
- Blank – Scanner would interpret the vote area as not including a mark and would not increment vote total forward, but would increment the ballots cast total forward

Testers anticipated the ICC scanner would conclude the following upon the initial scan of the test deck using the default Low-End 12% and High-End 35% threshold settings:

- Marked: 36
- Ambiguous: 42
- Blank: 22

Testers were anticipating that at the conclusion of scanning on the ICC, that a total of 64 ballots (42+22) would need adjudication performed to determine the intent placed on the marked test ballot.

An ICC scanner was configured with the default Low-End 12% and High-End 35% setting and the prepared test deck was scanned a total of two times using the setting configuration. This process created two batches collected by the ICC scanner, each batch containing 100 ballots. Each batch was then loaded into the Adjudication Client application. The Adjudication Client application was set to review all ballots within the batch and isolate any ballots containing Ambiguous Marks, Blank Ballots, and Overvotes (standard Adjudication Client settings).

Upon review in the Adjudication Client, testers created 6 criteria into which each ballot could fall upon scanner review. Those criteria are as follows:

- Marked – All contests on ballot contained a single interpretable mark
- 1/3 Ambiguous – One of the three contests on the ballot contained a mark requiring review

- 2/3 Ambiguous – Two of the three contests on the ballot contained a mark requiring review
- Ambiguous – All three contests on the ballot contained a mark requiring review
- Blank Ballot – All three contests on the ballot contained no interpretable marks
- Overvote – All contests on ballot contained multiple interpretable marks

Testers documented the following upon completing the review of each batch within the Adjudication Client:

- Marked: 53
- 1/3 Ambiguous 15
- 2/3 Ambiguous 11
- Ambiguous 12
- Blank Ballot 9
- Overvote 0

The Low-End 12% and High-End 35% setting performed better at interpreting the intent of the voter contained within the test deck than the testing team had initially theorized. A total of 47 ballots required some level of review after being processed by the ICC instead of the theorized 64 ballots, a difference of 17 ballots. Of concern, is the result that nearly half of the test deck required additional review to determine intent.

In an effort to assess what impact a reduction in the High-End setting level would have on potential ambiguously marked ballots being scanned by an ICC, testers reduced the High-End setting from 35% to 30%. No adjustment was made the Low-End setting of 12%.

An ICC scanner was configured with the default Low-End 12% and High-End setting to 30% and the prepared test deck was scanned a total of two times using the setting configuration. This process created two batches collected by the ICC scanner, each batch containing 100 ballots. Each batch was then loaded into the Adjudication Client application. The Adjudication Client application was set to review all ballots within the batch and isolate any ballots containing Ambiguous Marks, Blank Ballots, and Overvotes (standard Adjudication Client settings).

Testers documented the following upon completing the review of each batch within the Adjudication Client:

- Marked: 61
- 1/3 Ambiguous 10
- 2/3 Ambiguous 10
- Ambiguous 9
- Blank Ballot 10
- Overvote 0

With a Low-End 12% and High-End 30% setting, there was a 17% reduction in the number of ballots (47 to 39) after scanning needing further review. The reduction of the High-End setting resulted in 8 more ballots being processed as marked and an intent being registered and tabulated without need of review. It appears this reduction (30% from 35%) did have an impact in relation to how the ICC scanner processed the prepared test deck.

To further assess the impact of High-End setting reduction on potentially ambiguously marked ballots, testers lowered the High-End setting and performed another test. For this test, no adjustment was made to the Low-End 12% setting, but the High-End setting was reduced and set to 25%.

An ICC scanner was configured with the default Low-End 12% and High-End setting adjusted to 25% and the prepared test deck was scanned a total of two times using the setting configuration. This process created two batches collected by the ICC scanner, each batch containing 100 ballots. Each batch was then loaded into the Adjudication Client application. The Adjudication Client application was set to review all ballots within the batch and isolate any ballots containing Ambiguous Marks, Blank Ballots, and Overvotes (standard Adjudication Client settings).

Testers documented the following upon completing the review of each batch within the Adjudication Client:

- Marked: 62
- 1/3 Ambiguous 15
- 2/3 Ambiguous 6
- Ambiguous 7
- Blank Ballot 10
- Overvote 0

With a Low-End 12% and High-End 25% setting, there was a 19% reduction in the number of ballots (47 to 39) after scanning needing further review, in relation to the original default setting. The reduction of the High-End setting to 25% resulted in 9 more ballots being processed as marked and an intent being registered and tabulated without need of review in comparison to the original scan using the default setting. However, the difference between the number of ballots needing review after scanning at High-End 30% and High-End 25% only resulted in one additional ballot being moved to the Marked criteria. This result indicates that in relation to the test deck used, this particular reduction (25% from 30%) in High-End setting did not have as much impact as the initial reduction (30% from 35%).

Testers adjusted the High-End setting one additional time in an effort to see what impact another reduction may have in relation to processing the prepared test deck. For this test, no adjustment was made to the Low-End 12% setting, but the High-End setting was reduced and set to 20%.

An ICC scanner was configured with the default Low-End 12% and High-End setting adjusted to 20% and the prepared test deck was scanned a total of two times using the setting configuration. This process created two batches collected by the ICC scanner, each batch containing 100 ballots. Each batch was then loaded into the Adjudication Client application. The Adjudication Client application was set to review all ballots within the batch and isolate any ballots containing Ambiguous Marks, Blank Ballots, and Overvotes (standard Adjudication Client settings).

Testers documented the following upon completing the review of each batch within the Adjudication Client:

- Marked: 70
- 1/3 Ambiguous 10
- 2/3 Ambiguous 8

• Ambiguous	1
• Blank Ballot	10
• Overvote	1

With a Low-End 12% and High-End 20% setting, there was a 36% reduction in the number of ballots (47 to 30) after scanning needing further review, in relation to the original default setting. The reduction of the High-End setting to 20% resulted in 17 more ballots being processed as marked and an intent being registered and tabulated without need of review in comparison to the original scan using the default setting. In addition, the difference between the number of ballots needing review after scanning at High-End 25% and High-End 20% resulted in eight additional ballots being moved to the Marked criteria. This result indicates that in relation to the test deck used, this particular reduction (20% from 25%) in High-End setting had as much impact as the initial reduction (30% from 35%). The reduction to 20% also resulted in a potential overvote being detected in the test deck that had previously been undetected using the higher High-End settings. The reduction in High-End setting from 35% to 20% reduced the number of ballots with all contests registering an ambiguous mark from 12 to 1. The reduction did not remove the detection of ambiguous marks, but it does appear to reduce the number of instances where the review of all contests on a ballot would be needed.

Testers concluded review by leaving the High-End 20% setting and lowering the Low-End to 10%. The reduction was done in an effort to reveal if there were any additional ambiguous marks that could be detected and made available for review to users with the lower mark threshold.

An ICC scanner was configured with the default Low-End 10% and High-End setting adjusted to 20% and the prepared test deck was scanned a total of two times using the setting configuration. This process created two batches collected by the ICC scanner, each batch containing 100 ballots. Each batch was then loaded into the Adjudication Client application. The Adjudication Client application was set to review all ballots within the batch and isolate any ballots containing Ambiguous Marks, Blank Ballots, and Overvotes (standard Adjudication Client settings).

Testers documented the following upon completing the review of each batch within the Adjudication Client:

• Marked:	71
• 1/3 Ambiguous	13
• 2/3 Ambiguous	6
• Ambiguous	2
• Blank Ballot	7
• Overvote	1

With the Low-End 10% and High-End 20% setting, there was a 38% reduction in the number of ballots (47 to 29) after scanning needing further review, in relation to the original default setting. The reduction in Low-End setting added with the reduction in High-End setting reduced the number of instances of Ambiguous (12 to 2) and Blank ballots (9 to 7) from the original default setting. The reduction in Low-End setting to 10% partnered with a High-End setting of 20% did not remove the detection of ambiguous marks or blank ballots, but it does appear the combination of these settings eliminated the need to review some ballots and reduced the number of contests per ballot needing review when a ballot review was detected.

During the assessment, the testers also made note of what type of marks where placed in or around the vote target area. In addition to partial filling in of the vote target oval, various types of marks, like X's, checkmarks, dashes, and dots, were seen on the ballot and registered by the ICC when they were placed within the vote target area. The darker the mark within the vote target area, the easier the ICC registered the mark. This indicates the voter can use an assortment of marks when completing their ballot, but the most important factors are for them to place the mark firmly and fill in the majority of the vote target area to the left of the candidate name or choice.

At the conclusion of Low-End and High-End setting adjustments, 29 ballots remained as needing some sort of physical review. Of those 29, seven (7) ballots were seen by the ICC as completely blank. The seven ballots upon physical review showed that five (5) ballots contained no physical mark anywhere within the vote target area, but did have the candidate name circled or underlined. The remaining two (2) ballots seen as blank by the ICC, upon visually review, did have discernable marks within the vote target area. However the mark was made with red ink.

These findings indicate that instructions to voters on how to properly mark the ballot need to inform the voter to fill in the proper area next to the candidate name and to avoid circling, underlining, or otherwise marking the candidate name, which is outside the vote target area. Voters should also be warned to not use red ink.

